

Novel Composite Membrane for Space Life Supporting System, Phase I

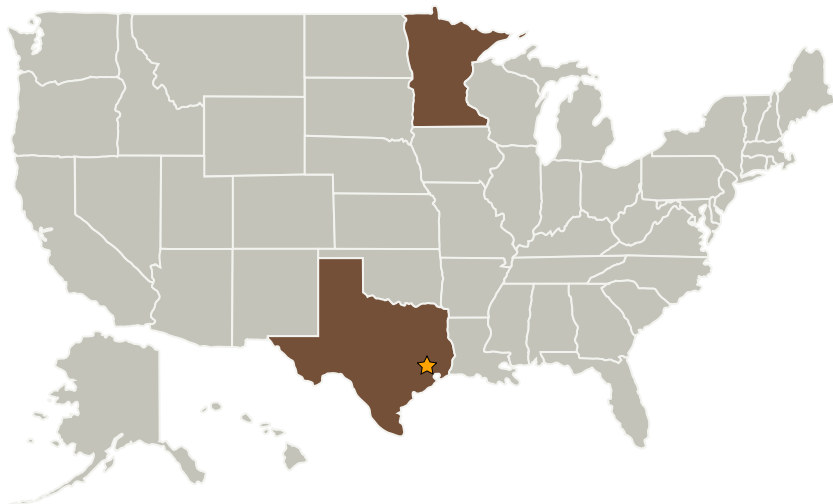
Completed Technology Project (2005 - 2005)



Project Introduction

Space life-supporting systems require effective removal of metabolic CO₂ from the cabin atmosphere with minimal loss of O₂. Conventional techniques, using either metal hydroxide or metal oxide sorbent, require after-mission regeneration or replacement, thus putting a critical cap on mission duration. More recent techniques, such as pressure swing adsorption-based process also require regeneration and use expendable resources. A novel approach to the problem is the use of a membrane device that can effectively separate CO₂ in the presence of moisture, using space vacuum as the driving force. Such a membrane device has minimal mass, volume and power penalty and does not require regeneration; therefore, long-duration space exploration can be realized. In Phase I, we will develop a novel nanocomposite membrane with a microporous aminosilicate structure for enhanced CO₂ separation with simultaneous humidity control. CO₂ preferentially adsorbs onto the pore surfaces of the aminosilicate membrane and transports via surface diffusion, thus resulting in pore blockage or pore size reduction to prevent other inert gases such as O₂ and N₂ from permeating through. With the combination of molecular sieving and surface diffusion mechanisms, the proposed membrane can be expected to achieve superb CO₂ separation performance for effective spacecraft cabin air revitalization.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
T3 Scientific LLC	Supporting Organization	Industry	Arden Hills, Minnesota

Primary U.S. Work Locations

Minnesota	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Chung-yi (andy) Tsai

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization